We claim:

1.   A method of processing and interpreting seismic data, comprising:

5   identifying a plurality of extrema positions associated with said seismic data;

deriving coefficients that characterize the seismic data waveform in the vicinity of

said extrema positions; and

forming groups of said extrema positions where said coefficients are similar.

10   2.   A method according to claim 1, wherein said extrema positions are identified with

sub-sample precision.

3.   A method according to claim 1, wherein said coefficients are derivatives.

15   4.   A method according to claim 3, wherein said derivatives are determined using

orthogonal polynomials and said derivatives allow local reconstructions of seismic traces in

the vicinity of said extrema positions to be obtained using Taylor series expansions.

5.   A method according to claim 1, wherein said seismic data is subjected to orthogonal

20   polynomial spectral decomposition and said extrema positions are identified based on said

decomposed seismic data.

6.   A method according to claim 5, wherein said orthogonal polynomial spectral

decomposition comprises volume reflection spectral decomposition with Chebyshev

25   polynomials used as the basis functions.

7.   A method according to claim 1, wherein said process of forming groups of said

extrema positions utilizes a statistical model which assumes that coefficient attribute vectors

are Gaussian distributed within each class.

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8.   A method according to claim 1, wherein said groups of extrema positions are formed

using supervised classification.

9.   A method according to claim 8, wherein seed points for said supervised classification

10   are picked by a user.

10.   A method according to claim 1, wherein said groups of extrema positions are formed

using unsupervised classification.

15   11.   A method according to claim 10, wherein a number of classes for said unsupervised

classification is provided by a user.

12.   A method according to claim 10, wherein seed points for said unsupervised

classification are selected at random and small spatially contiguous horizon segments are

20   extracted locally around said seed points.

13.   A method according to claim 1, further including defining a volume of interest within

said seismic data.

14.   A method according to claim 13, wherein said volume of interest comprises a vertical window of constant thickness or a volume between two pre-interpreted seismic horizons.

15.   A method according to claim 1, wherein horizon segments are extracted on opposite sides of input fault surfaces.

16.   A method according to claim 15, wherein fault displacement estimates are determined using said extracted horizon estimates.

17.   A method according to claim 16, wherein said fault displacement estimates are decomposed into vertical throw and horizontal heave components.

18.   A method according to claim 1, wherein said groups of extrema positions are used to create a horizon interpretation.

19.   A method according to claim 1, wherein said groups of extrema positions are used to extract a seismic volume containing multiple reflectors having similar seismic response.

20.   A computer system for processing and interpreting seismic data, comprising:

(a)   means for identifying a plurality of extrema positions associated with said seismic data;

(b)   means for deriving coefficients that characterize the seismic data waveform in the vicinity of said extrema positions; and

(c)   means for forming groups of said extrema positions where said coefficients are similar.

21.   A computer program product for processing and interpreting seismic data,

comprising:

a computer useable medium having computer readable program code embodied in

said medium for processing seismic data, said computer program product having:

5   (a)   computer readable program code means for identifying a plurality of extrema

positions associated with said seismic data;

(c)   computer readable program code means for deriving coefficients that characterize the

seismic data waveform in the vicinity of said extrema positions; and

(c)   computer readable program code means for forming groups of said extrema positions

10   where said coefficients are similar.